

Gas supply systems — Underground gas storage —

Part 3: Functional recommendations for storage in solution-mined salt cavities

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ICS 75.200

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 16, an inside back cover and a back cover.

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Système d'alimentation en gaz —
Stockage souterrain de gaz —
Partie 3: Recommandations fonctionnelles pour le
stockage en cavités salines creusées par dissolution

Gasversorgungssysteme —
Untertagespeicherung von Gas —
Teil 3: Funktionale Empfehlungen für die
Speicherung in gesolten Salzkavernen

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Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 234, Gas supply, the Secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 1998, and conflicting national standards shall be withdrawn at the latest by August 1998.

It is Part 3 of a standard on underground gas storage, which includes the five following parts:

- Part 1: Functional recommendations for storage in aquifers*
- Part 2: Functional recommendations for storage in oil and gas fields*
- Part 3: Functional recommendations for storage in solution-mined salt cavities*
- Part 4: Functional recommendations for storage in rock caverns*
- Part 5: Functional recommendations for surface facilities*

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Introduction

The underground storage of compressed natural gas (CNG) and liquified petroleum gas (LPG) in solution-mined salt cavities is a proven technology for adjusting gas supply systems to short-term and seasonal changes in gas demand.

It is known that suitable salt layers and salt domes are impermeable to gas at normal pressures. In addition, cracks and faults in the salt are healed by the viscoplastic behaviour of the salt under the geostatic pressure.

A cavity is constructed by drilling a well into the salt dome or salt layer deposit with adequate protection for the underlying and overlying stratas. Figure 1 illustrates a gas cavity in a salt dome or salt strata.

Cavities are leached by the controlled circulation of water with known solution characteristics down the wellbore into the salt zone and back as brine to the surface (see Figure 2).

Cavities for compressed natural gas (CNG)

Once the design volume has been reached, the brine is displaced from the cavity by the controlled injection of CNG.

The pressure in a CNG cavity can be cycled between the minimum and the maximum operating pressure of the cavity.

Cavities for liquid petroleum gas (LPG)

Once the design volume of the cavity has been reached, the brine is displaced from the cavity by controlled injection of LPG.

The brine is generally collected in a pond, which has the minimum volume for the volume of the cavity. When it is necessary to recover the LPG from the cavity, the brine stored in the pond will be injected into the cavity, while the LPG comes out. An LPG cavity, in this case, does not require any downhole pumping equipment.

This is the most common method for constructing and operating an LPG cavity in salt. With shallow salt cavities, however, the operation may be similar to the operation of a rock cavern for LPG (see EN 1918-4).

Figure 3 gives a schematic view of an LPG cavity in operation.

There are more than 30 years of experience of storage of CNG and LPG in solution-mined salt cavities, and the technique is well known and highly developed.

To guarantee a high level of safety, sophisticated techniques are available for:

- the evaluation of the suitability of the geological salt formation for storage;
- the description of the salt behaviour under stress conditions;
- the description of the local stresses around the salt cavities and the demonstration of its mechanical stability;
- drilling, cementing and completion of wells to prevent external gas migration from the cavity towards the surface or upper geological formations;
- controlled leaching of the cavity to its design form and size;
- first gas filling under controlled conditions;
- monitoring critical parameters of the cavities in operation.

